

MODULE 15

NWS WARNINGS AND ADVISORIES

OBJECTIVES

At the completion of this module, the student will be able to

- 1) Identify National Weather Service hazardous weather products
- 2) Recognize the characteristics of an effective severe weather warning
- 3) Correctly decide on the appropriate NWS product given a particular weather situation

INTRODUCTION

The primary mission of the National Weather Service (NWS), as dictated by Congress, is to protect life and property in the country by issuing timely warnings and forecasts for hazardous weather. The training you will complete and the skills you will gain in severe weather analysis and forecasting techniques are a foundation for this fundamental mission.

While warning issuance is the NWS' primary mission, it is not our only duty. The NWS is also responsible for issuing a variety of forecasts for public, aviation, and marine use. These products include the general forecasts like those shown on weathercasts and extended forecasts covering the three- to five-day period. Products for aviation customers feature extremely detailed cloud and visibility forecasts. Marine forecast products describe expected winds, wave heights, and unusual occurrences such as coastal flooding. During hazardous weather, all of these "routine" forecasts must be issued in addition to the specialized products we will discuss here.

In this module, we will give an overview of the warning philosophy and discuss the purposes of our warning messages. We will describe the structure of a typical warning message and show a number of examples. Finally, we will outline some of the other products, such as follow-up statements and short term forecasts, that you will prepare in the forecast and warning operations.

PHILOSOPHY OF WARNING

As indicated above, the NWS' most important task is to issue timely warnings and forecasts for severe or hazardous weather. The warnings and statements we issue during times of severe weather have two main objectives. First, we hope to notify people of the danger which is in or near their location. Second, we must inform people of actions they should take to protect themselves, their families, and their property from the weather hazard.

Notifying people of the danger which exists is a straightforward process. Warnings and statements typically contain a one- or two-sentence description of where the severe weather is located, where it is moving, and the type of weather (hail size, wind speed, etc.) which is expected to occur. This is often referred to as the **basis** of the warning or statement. The information given in the basis may contain radar indications, spotter reports, or a combination of the two. We will give a number of examples of these descriptions later.

Hazardous weather warnings have been a part of NWS operations since the 1950s. In the early days, warnings simply contained the location of the danger as described above. It was felt that this was sufficient until Hurricane Audrey struck the southwestern Louisiana coast in 1957. The warnings issued by the National Hurricane Center were excellent in describing the location and potential impact of the storm. An excerpt of one of the warnings is shown below:

THE GALE FORCE WINDS WILL REACH THE LOUISIANA COAST TONIGHT. TIDES ARE RISING AND WILL REACH 5 TO 8 FEET ALONG THE LOUISIANA COAST AND OVER MISSISSIPPI SOUND BY LATE THURSDAY. ALL PERSONS IN LOW EXPOSED PLACES SHOULD MOVE TO HIGHER GROUND.

The actual conditions were very close to those described in the warning. The warning was issued about 18 hours before the storm struck, so people in the storm's path had sufficient time to protect themselves. However, when Audrey made landfall, over 400 people were killed! What happened? Surveys conducted by NWS staff showed that people were aware that a storm was coming, but they really didn't have a good idea of what to do to protect themselves. Many of them lived in areas about 6 feet above sea level, but they didn't feel that they were in a "low exposed place". A recommendation from this and other surveys in the 1950s and early 1960s called for the NWS to add specific **call-to-action** statements to hazardous weather products. We will show some sample call-to-action statements later in this module.

There are three primary types of warnings that will be issued during the TWISTER operations:

TORNADO WARNING - issued when spotters report a tornado or a developing tornado, or when radar indications suggest a tornado is imminent or occurring. Radar indications include a moderate to strong mesocyclone at low levels, a Tornado Vortex Signature (TVS), and/or radar reflectivity signatures (a hook echo at low levels, a bounded weak echo region at mid levels, etc.). Tornado warnings also imply the possibility of other severe weather in the form of large hail and strong downburst winds. The definitions and significance of these features are described in the Radar Principles and Radar Analysis modules.

FLASH FLOOD WARNING - issued when flash flooding is imminent or occurring. Flash flooding is the result of excessive rainfall over a small area for a relatively short period of time. As evidenced during the Metroplex storm of May 5, 1995, flash flooding is often a bigger killer than tornadoes or hailstorms. Flooding reports often are received from storm spotters, although the reporting criteria for flash flooding are less discrete than those for tornadoes and severe weather. However, radar precipitation estimates can also be used to estimate locations and amounts of heavy rainfall.

SEVERE THUNDERSTORM WARNING - issued when spotters report hail 3/4 inch in diameter or larger and/or wind gusts 58 mph or stronger. Severe thunderstorm warnings can also be issued if radar indications suggest the possibility of these conditions. Radar signatures include Vertically Integrated Liquid (VIL) values of about 50 kg/m² or higher, strong Doppler velocity values, and reflectivity signatures (strong low-level reflectivity gradient, weak echo region, etc.). Again, these features are described in the radar modules.

STRUCTURE OF A WARNING

NWS Operations Manual Chapter C-40 spells out specific guidelines for the structure and content of hazardous weather warnings. Warnings contain six primary components: media headers, the warning type, the valid time, the warned area, the basis for the warning, and one or more call-to-action statements. These components are outlined in more detail in the sample warning shown below.

FTWTORFTW TTAA00 KFTW 212232 TXC445-212315-	1
BULLETIN - EAS ACTIVATION REQUESTED TORNADO WARNING NATIONAL WEATHER SERVICE FORT WORTH TX 432 PM CST THU MAR 21 1996	2
THE NATIONAL WEATHER SERVICE IN FORT WORTH HAS ISSUED A * TORNADO WARNING * EFFECTIVE UNTIL 515 PM CST	3
FOR PEOPLE IN NORTH CENTRAL TEXAS... * WISE COUNTY	4
AT 430 PM CST...NATIONAL WEATHER SERVICE RADAR INDICATED A POSSIBLE TORNADO 5 MILES WEST OF BOYD. MOVEMENT OF THE STORM WAS EAST AT 30 MILES AN HOUR. PEOPLE IN BOYD AND RHOME ARE IN THE PATH OF THIS STORM AND SHOULD TAKE COVER IMMEDIATELY.	5
IF YOU ARE IN THE PATH OF A TORNADO...YOU SHOULD MOVE INSIDE A BASEMENT. IF NO BASEMENT IS AVAILABLE...TAKE COVER IN AN INTERIOR ROOM ON THE LOWEST FLOOR OF YOUR HOME OR BUILDING. REESE	6

1. Media Headers

The top three lines of the warning are communications headers, for routing the warning through the NWS communications system and to systems used by TV stations and local emergency management agencies. This is the coding used by the systems at some TV stations to automatically send a “crawl” across the bottom of the screen or to place small color-coded maps in the bottom corner of their telecasts.

2. Warning Type

The next four lines are the “plain language” warning header. The top line in this group contains the “bulletin” line requesting either Emergency Alert System (EAS) activation or immediate broadcasting. The next line is the title of the product, followed by the issuing NWS office and the time the warning was issued.

3. Valid Time

The next group of lines contains the expiration time of the warning. This group also repeats the issuing office and the type of warning which was issued.

4. Warned Area(s)

The next group denotes the warned county and the part of the state in which the county is located. Warnings may be issued for whole counties, parts of counties, or for multiple counties. Generally, warnings should be issued for two or fewer counties. With multi-county warnings, severe weather must be reported in each warned county for the warning to verify.

5. Basis for Warning

This is a key component of the warning. The basis should describe the reason for issuing the warning. It should include the location and movement of the hazardous weather, the expected impacts (hail size, wind speed, etc.), and a short list of communities in the storm’s path. As indicated earlier, the basis may be a radar indication and/or a report from storm spotters.

6. Call-to-Action Statement

Finally, the warning should include a few sentences listing protective actions which should be taken by people in the warned area. Common tornado, flash flood, and thunderstorm safety rules are often included in the call-to-action statement.

At first glance, it seems that there is a lot of information for forecasters to remember when attempting to compose a warning. Fortunately, the NWS has computer software, called WISE (Warning and Information Statement Editor), which automatically codes and formats many of these components. WISE also allows you to select a “canned” call-to-action statement based on the hazard for which you are warning. Even with the WISE software, though, there are elements in the basis section for which you are responsible. Again, the elements required in the basis are:

- * The time and location of the event
- * The movement of the event
- * Expected impacts (hail size, wind speed) from the storm
- * Communities which are near the forecast path of the storm

WARNING EXAMPLES

This section contains a number of warning examples showing the format and wording to be used. The sample warnings illustrate a wide variety of hazardous weather (tornado, severe thunderstorm, flash flood warnings) and a number of bases for warnings (radar, spotter reports).

Note carefully the wording used in each warning. If you are assigned the Communications Officer position, you will need to quickly compose warnings using this style. If you work the Radar Observer or Forecaster position, you may be called upon to assist the Communications staff if they become overwhelmed with reports and warnings.

Tornado Warning - Radar Indication

FTWTORFTW
TTAA00 KFTW 072318
TXC097-080000-

BULLETIN - EAS ACTIVATION REQUESTED
TORNADO WARNING
NATIONAL WEATHER SERVICE FORT WORTH TX
618 PM CST SUN MAR 18 1996

THE NATIONAL WEATHER SERVICE IN FORT WORTH HAS ISSUED A

- * TORNADO WARNING
- * EFFECTIVE UNTIL 700 PM CST

FOR PEOPLE IN IN NORTH CENTRAL TEXAS...

- * EASTERN ELLIS COUNTY

AT 616 PM CST...NATIONAL WEATHER SERVICE RADAR INDICATED A POSSIBLE
TORNADO 3 MILES SOUTH OF WAXAHACHIE.

MOVEMENT OF THE STORM WAS EAST AT 20 MILES AN HOUR. PEOPLE IN ENNIS
ARE IN THE PATH OF THIS STORM AND SHOULD TAKE COVER IMMEDIATELY.

IF YOU ARE IN THE PATH OF A TORNADO...YOU SHOULD MOVE INSIDE A
BASEMENT. IF NO BASEMENT IS AVAILABLE...TAKE COVER IN AN INTERIOR
ROOM ON THE LOWEST FLOOR OF YOUR HOME OR BUILDING.

MARTINSON

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Note that the warning was issued only two minutes after the radar signature was detected. When issuing radar-based warnings or statements, do not use meteorological terms such as “mesocyclone” or “TVS”. These are terms that the public generally does not understand. Instead, use wording such as “possible tornado”, “developing tornado”, or “likely tornado”. Issue the warning for as small an area as possible. In this case, the event was already in the central part of the county, moving east, so there was no need to warn the entire county. Generally, tornado warnings should be issued for only 30-45 minutes at a time.

Tornado Warning - Spotter Report

FTWTORFTW
TTAA00 KFTW 202244
TXC445-202315-

BULLETIN - EAS ACTIVATION REQUESTED
TORNADO WARNING
NATIONAL WEATHER SERVICE FORT WORTH TX
444 PM CST WED MAR 20 1996

THE NATIONAL WEATHER SERVICE IN FORT WORTH HAS ISSUED A

- * TORNADO WARNING
- * EFFECTIVE UNTIL 515 PM CST

FOR PEOPLE IN NORTH CENTRAL TEXAS...

- * PARKER COUNTY

AT 443 PM CST...STORM SPOTTERS REPORTED A TORNADO 7 MILES SOUTHWEST OF WEATHERFORD. MOVEMENT OF THE STORM WAS NORTHEAST AT 35 MPH.

PEOPLE IN WEATHERFORD ARE IN THE PATH OF THIS TORNADO AND SHOULD TAKE COVER NOW!

THIS IS A DANGEROUS STORM SITUATION. ACT QUICKLY. IF YOU ARE CAUGHT IN THE OPEN...SEEK SHELTER IN A SUBSTANTIAL BUILDING. IF NO BUILDING IS NEARBY...TAKE COVER IN A DITCH...RAVINE...OR LOW SPOT AND COVER YOUR HEAD WITH YOUR HANDS.

CARLISLE

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In this case, a tornado has been confirmed heading toward a populated area. The resulting warning should be strongly worded to motivate the people in the storm's path to take appropriate actions. Although the tornado report was from spotters, we still must consult the radar to get the storm's movement. Generally, tornado warnings should not be issued for longer than 45 minutes (this particular warning was issued for only 30 minutes). The storm will likely still be severe after the warning's expiration time, but it is very uncertain if the storm will still be tornadic. Re-evaluating the storm after 30-45 minutes will help prevent overusing the tornado warning. Since the tornado was reported in the southwest portion of the county and moving northeast, issuing for the entire county is as precise as we can be regarding the warned area.

Severe Thunderstorm Warning - Radar Indication

FTWSVRFTW
TTAA00 KFTW 010133
TXC453-010230-

BULLETIN - IMMEDIATE BROADCAST REQUESTED
SEVERE THUNDERSTORM WARNING
NATIONAL WEATHER SERVICE FORT WORTH TX
733 PM CST WED MAR 20 1996

THE NATIONAL WEATHER SERVICE IN FORT WORTH HAS ISSUED A

- * SEVERE THUNDERSTORM WARNING
- * EFFECTIVE UNTIL 830 PM CST

FOR PEOPLE IN NORTH CENTRAL TEXAS...

- * PALO PINTO COUNTY

AT 732 PM CST...NATIONAL WEATHER SERVICE RADAR INDICATED A SEVERE THUNDERSTORM 6 MILES SOUTH OF POSSUM KINGDOM LAKE. GOLF BALL SIZE HAIL AND STRONG WINDS ARE LIKELY WITH THIS STORM. MOVEMENT WAS EAST AT 25 MPH.

PEOPLE IN PALO PINTO AND MINERAL WELLS ARE IN THE PATH OF THIS STORM AND SHOULD TAKE COVER.

FOR YOUR PROTECTION MOVE TO AN INTERIOR ROOM ON THE LOWEST FLOOR OF YOUR HOME OR OFFICE. AVOID USING ELECTRICAL APPLIANCES AND STAY AWAY FROM WINDOWS.

RICO

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As with tornado warnings, use plain-language terms when describing the storm situation. Don't use terms such as "VIL", "WER", or "50 dBZ CORE". If your radar observers are good, they should be able to use the VIL and reflectivity products to give an estimated hail size in addition to the storm movement. Again, communities in or close to the storm's forecast path should be mentioned in the warning. Severe thunderstorm warnings can be issued for slightly longer periods than tornado warnings; valid times are usually for one hour.

Severe Thunderstorm Warning - Spotter Report

FTWSVRFTW
TTAA00 KFTW 082304
TXC495-090000-

BULLETIN - IMMEDIATE BROADCAST REQUESTED
SEVERE THUNDERSTORM WARNING
NATIONAL WEATHER SERVICE FORT WORTH TX
504 PM CST WED MAR 20 1996

THE NATIONAL WEATHER SERVICE IN FORT WORTH HAS ISSUED A

- * SEVERE THUNDERSTORM WARNING
- * EFFECTIVE UNTIL 545 PM CST

FOR PEOPLE IN NORTH CENTRAL TEXAS...

- * NORTHEASTERN TARRANT COUNTY

AT 503 PM CST...SPOTTERS REPORTED QUARTER SIZE HAIL IN RICHLAND HILLS.
RADAR INDICATED THE STORM WAS MOVING NORTHEAST AT 25 MPH.

PEOPLE IN HURST...BEDFORD...AND GRAPEVINE SHOULD PREPARE FOR LARGE
HAIL FROM THIS STORM.

IF YOU ARE CAUGHT OUTSIDE...SEEK SHELTER FROM THE WEATHER IN A
STRONG BUILDING. REMAIN INDOORS AWAY FROM WINDOWS UNTIL THE
STORM PASSES.

JORDAN

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Again, severe thunderstorm warnings are generally issued for periods of up to one hour, although this particular warning was issued for only 45 minutes. The basis should contain the elements as described in the previous warning examples. In this case, the storm was already in the northeastern quadrant of the county and moving northeast, so the warning was issued for only the county's northeastern portion. Severe thunderstorm warnings may of course be issued for spotter reports of high wind (58 mph or stronger) as well as large hail.

4. OTHER SEVERE WEATHER PRODUCTS

Severe Weather Statement

Severe weather statements are short products, only a few sentences in length. Severe weather statements are used to provide follow-up information while tornado or severe thunderstorm warnings are in effect. Severe weather statements usually include ground truth reports of severe weather and/or location updates of severe thunderstorms and a brief call-to-action statement. These products should be issued at least every 15-20 minutes or so when warnings are in effect. During very critical situations (i.e., a tornado in a populated area), severe weather statements should be prepared as frequently as possible. See the examples below.

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FTWSVSFTW

TTAA00 KFTW 282142

TXZ113-282230-

SEVERE WEATHER STATEMENT

NATIONAL WEATHER SERVICE FORT WORTH TX

342 PM CST THU MAR 28 1996

...TORNADO REPORTED IN CEDAR HILL...

AT 339 PM...SPOTTERS REPORTED A TORNADO ON THE GROUND AND DOING
DAMAGE IN CEDAR HILL. MOVEMENT WAS NORTHEAST AT 30 MPH.

PEOPLE IN CEDAR HILL...DUNCANVILLE...AND DE SOTO SHOULD TAKE COVER!

KORTUM

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FTWSVSFTW

TTAA00 KFTW 232239

TXZ094-222330-

SEVERE WEATHER STATEMENT

NATIONAL WEATHER SERVICE FORT WORTH TX

439 PM CST SAT MAR 23 1996

...SEVERE THUNDERSTORM WARNING FOR COOKE COUNTY UNTIL 500 PM...

AT 438 PM...A SEVERE THUNDERSTORM WAS LOCATED 7 MILES WEST OF
GAINESVILLE. SPOTTERS REPORTED GOLF BALL SIZE HAIL 4 MILES SOUTHEAST
OF MUENSTER. MOVEMENT OF THE STORM WAS EAST AT 35 MPH. THE STORM
SHOULD MOVE ACROSS GAINESVILLE BY 515 PM.

MURPHY

Flash Flood Statement/Urban Flood Advisory

Flash flood statements are used to provide follow-up information when a flash flood warning is in effect. Urban flood advisories are issued when minor street flooding is reported, but the extent of the flooding is not sufficient to warrant a flash flood warning (i.e., not a significant threat to life or property). Flash flood/urban flood products may contain information from radar or spotters. Call-to-action statements are usually included with either variety of flood statement. They are issued at least every 30 minutes or so when flooding is occurring, or more frequently if significant changes are occurring. See the examples below.

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FTWFFSFTW

TTAA00 KFTW 041922

TXZ057-042030-

FLASH FLOOD STATEMENT

NATIONAL WEATHER SERVICE FORT WORTH TX

122 PM CST THU APR 4 1996

...FLASH FLOOD WARNING FOR COLLIN COUNTY UNTIL 230 PM...

AT 119 PM...SPOTTERS REPORTED FLOODING IN AND NORTH OF PLANO. CARS WERE STRANDED BY HIGH WATER ALONG U.S. 75 IN PLANO.

NATIONAL WEATHER SERVICE DOPPLER RADAR SHOWED HEAVY RAINFALL CONTINUING OVER SOUTHERN AND CENTRAL COLLIN COUNTY. MOVEMENT WAS NORTHEAST AT 20 MPH. RADAR HAS ESTIMATED 2 TO 3 INCHES OF RAIN OVER THE WARNED AREA SINCE 1000 AM.

MOTORISTS SHOULD AVOID LOW-WATER CROSSINGS WHEN TRAVELING. IF YOUR VEHICLE STALLS IN HIGH WATER...ABANDON IT AND MOVE TO HIGHER GROUND IF YOU CAN DO SO SAFELY. CHILDREN SHOULD NOT BE ALLOWED TO PLAY IN OR NEAR FLOODED CREEKS OR OTHER HIGH WATER AREAS.

WARNER

Short Term Forecast

The short term forecast is used to describe the movement of non-severe thunderstorms across the area over the next hour or so. The forecast will primarily contain radar information, as any spotter reports should appear in severe weather or flash flood statements. Short term forecasts issued by the Communications Officers will concentrate on thunderstorm activity. The Lead and Assistant Forecasters will prepare products for the entire area of responsibility which detail other weather conditions (temperature, wind, cloud cover, etc.). Short term forecasts typically will be issued about every 30-40 minutes.

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FTWNOWFTW
TTAA00 KFTW 302040
TXZ114-115-137-138-302145-

SHORT TERM FORECAST
NATIONAL WEATHER SERVICE FORT WORTH TX
240 PM CST SUN MAR 30 1996

DENTON-PARKER-TARRANT-WISE COUNTY-
AN AREA OF THUNDERSTORMS EXTENDING FROM NEAR DECATUR TO WEST OF
WEATHERFORD WILL MOVE EAST TO NEAR A PONDER-ALEDO LINE BY 315 PM.
THE STORMS WILL PRODUCE BRIEF HEAVY RAINFALL...SMALL HAIL...AND WIND
GUSTS TO 35 MPH.

WOODALL

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FTWNOWFTW
TTAA00 KFTW 301719
TXZ102-103-115-116-124-301830-

SHORT TERM FORECAST
NATIONAL WEATHER SERVICE FORT WORTH TX
1119 PM CST SUN MAR 30 1996

ARCHER-CLAY-THROCKMORTON-WICHITA-YOUNG COUNTY-
A COLD FRONT WAS MOVING INTO NORTHWEST TEXAS. THUNDERSTORMS ARE
EXPECTED TO RAPIDLY DEVELOP BY NOON FROM WICHITA FALLS TO
THROCKMORTON. THE STORMS WILL MOVE EAST AT AROUND 25 MPH AND
SOME OF THE STORMS WILL BECOME SEVERE. AHEAD OF THE FRONT...SKIES
WILL BE PARTLY CLOUDY WITH TEMPERATURES CLIMBING INTO THE LOWER
80S. WINDS WILL BE SOUTH AT 10 TO 20 MPH.

NICHOLS

5. PRODUCT DECISION TREE

Tornado warning, severe thunderstorm warning, flash flood statement, short term forecast, severe weather statement, flash flood warning... how in the world are you supposed to keep the products and their uses straight? Figure 16-1 below should help. It is a decision tree, designed to systematically guide you through the weather situation and to the correct product. Start at the top-left hand corner of the diagram, answer the questions in each box, and follow the appropriate path based on your response. The Lead Radar Observer and Lead Communications Officer will be able to help you with some of the wording and the trickier situations, but the decision tree should get you through most of the routine events. (Note: in the diagram, “noteworthy” refers to wind 35 mph, pea to marble size hail, or heavy rainfall.)

Warning/Statement Decision Tree

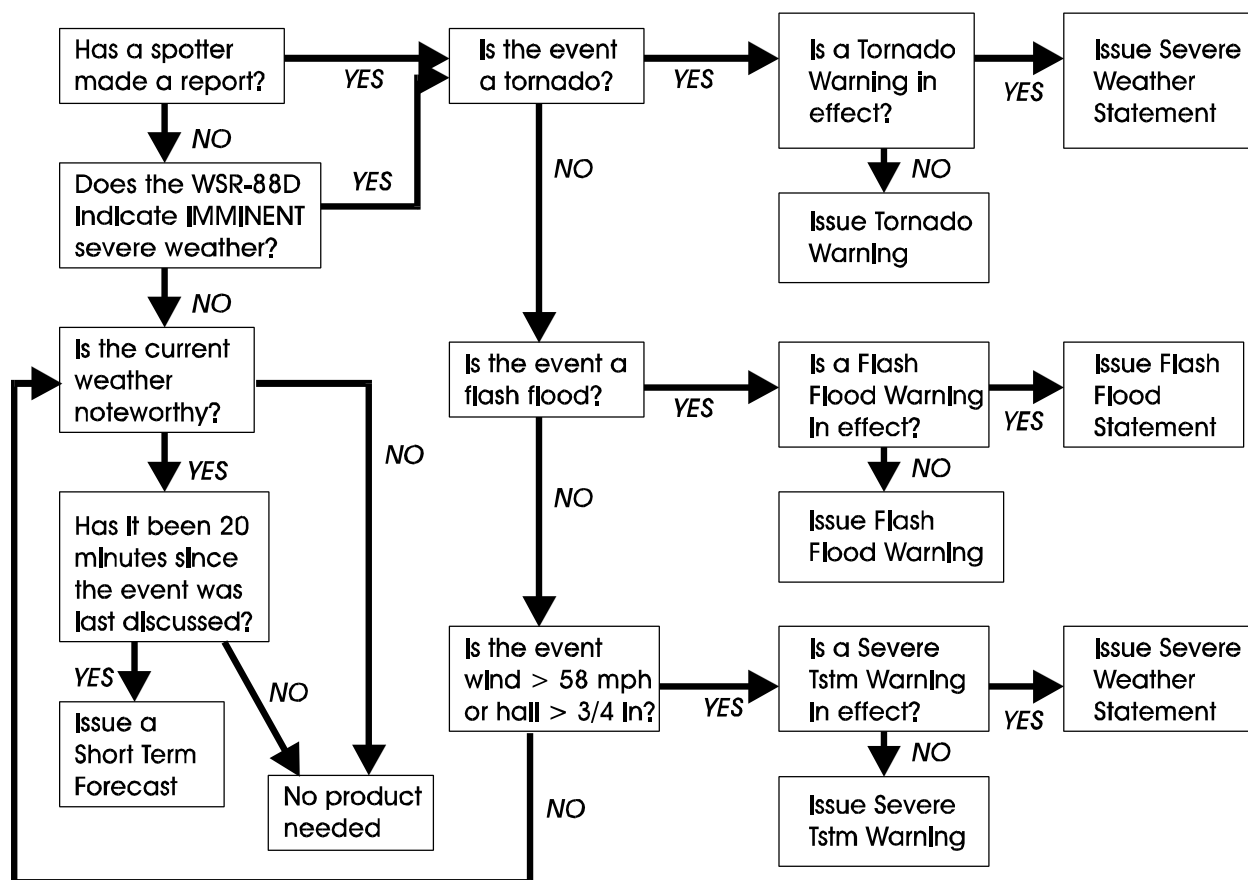


Figure 15-1: Decision Tree for warning/statement preparation.